CLAIMS

1. A microcavity structure comprising two or more microcavity waveguides, wherein one or more microcavity active regions are created by the overlap of said microcavity waveguides.

2. The microcavity structure of claim 1, wherein said microcavity overlap is defined by crossing of at least two of the said microcavity waveguide at an angle.

3. The microcavity structure of claim 1, wherein each waveguide includes at least two optical reflectors.

4. The microcavity structure of claim 3 wherein the optical reflector component comprises of a variation in material refractive index in order to change the direction of the incident optical energy.

5. The microcavity structure of claim 4 wherein the optical reflector could be, but is not restricted to, a structure with a periodic change in the refractive index such as a photonic crystal.

6. The microcavity structure of claim 3, wherein the optical reflectors surround the active microcavity regions.

7. The microcavity structure of claim 3, wherein one or more of the optical reflectors are less reflective to define one or more output paths of the generated light.

8. A microcavity structure of claim 1, wherein the microcavity waveguides provide means for material continuity to achieve the conduction of current to the active microcavity overlap regions.

9. The microcavity structure of claim 1, wherein said microcavity waveguides comprise means for electrical activation.

10. The microcavity structure of claim 9 further comprising at least one contact pad that is coupled to each of the microcavity waveguides so as to apply voltage across said microcavity structures.

11. The microcavity structure of claim 10, wherein the top waveguide comprises p-doped material and the bottom waveguide comprises n-doped material.

12. The microcavity structure of claim 10, wherein the top waveguide comprises n-doped material and the bottom waveguide comprises p-doped material.

13. The microcavity structure of claim 1 further comprising a mechanism to provide carrier confinement in the active overlap regions by converting the material under portion of the upper waveguide into an insulator.

14. The microcavity structure of claim 1, wherein at least one of the microcavity waveguides comprises active material used in the generation of photons.

15. A microcavity structure in claim 1, wherein the active material is composed of quantum wells and/or quantum dots.

16. The microcavity structure of claim 1, wherein at least one of said microcavity waveguides is used to guide light.

17. A method of forming a microcavity structure comprising:

providing two or more microcavity waveguides; and

forming one or more microcavity active regions by overlapping said microcavity waveguides.

18. The method of claim 17, wherein said microcavity overlap is defined by crossing of at least two of the said microcavity waveguide at an angle.

19. The method of claim 17, wherein each waveguide includes at least two optical reflectors.

20. The method of claim 19, wherein the optical reflector component comprises of a variation in material refractive index in order to change the direction of the incident optical energy.

21. The method of claim 20, wherein the optical reflector could be, but is not restricted to, a structure with a periodic change in the refractive index such as a photonic crystal.

22. The method of claim 19, wherein the optical reflectors surrounds the active microcavity regions.

23. The method of claim 19, wherein one or more of the optical reflectors are less reflective to define one or more output path of the generated light.

24. A method of claim 17, wherein the microcavity waveguides provide means for material continuity to achieve the conduction of current to the active microcavity overlap regions.

25. The method of claim 17, wherein said microcavity waveguides comprise means for electrical activation.

26. The method of claim 25 further comprising providing at least one contact pad that is coupled to each of the microcavity waveguides so as to apply voltage across said microcavity structures.

27. The method of claim 25, wherein the top waveguide comprises p-doped material and said bottom waveguide comprises n-doped material.

28. The method of claim 25, wherein the top waveguide comprises n-doped material and the bottom waveguide comprises p-doped material.

29. The method of claim 17 further comprising providing a mechanism to provide carrier confinement in the active regions by converting the material under portion of the upper waveguide into an insulator.

30. The microcavity structure of claim 17, wherein at least one of said first and second waveguides comprises active material used in the generation of photons.

31. A microcavity structure in claim 17, wherein the active material is composed of quantum wells and/or quantum dots.

32. The microcavity structure of claim 17, wherein at least one of said first and second waveguides is used to guide light.

33. A microcavity structure comprising:

a first waveguide including a first photonic crystal microcavity; and

a second waveguide including a second photonic crystal microcavity; and

a microcavity active region that is created by overlapping said first and second microcavities.

34. The microcavity of claim 33, wherein the photonic crystal surrounds the active microcavity region.

35. The microcavity structure of claim 33, wherein one or more of the photonic crystals are less reflective to define a single or multiple output path of the generated light.

36. The microcavity structure of claim 33, wherein the first and second waveguides provide means for material continuity to achieve the conduction of current to the active microcavity overlap region.

37. The microcavity structure of claim 33, wherein said first waveguide and second waveguide comprise means for electrical activation.

38. The microcavity structure of claim 37 further comprising at least one contact pad that is coupled to said first waveguide and at least one contact pad that is coupled to said second waveguide so as to apply voltage across said microcavity structure.

39. The microcavity structure of claim 37, wherein said first waveguide comprises p-doped material and said second waveguide comprises n-doped material.

40. The microcavity structure of claim 37, wherein said first waveguide comprises n-doped material and said second waveguide comprises p-doped material.

41. The microcavity structure of claim 33 further comprising a mechanism to provide carrier confinement to the active region by converting the material under portion of the upper waveguide into an insulator.

42. The microcavity structure of claim 33, wherein at least one of said first and second waveguides is used to guide light.

43. The microcavity structure of claim 33, wherein at least one of said first and second waveguides comprises active material used in the generation of photons.

44. The microcavity structure of claim 43, wherein said active material comprises quantum wells and/or quantum dots.

45. The microcavity structure of claim 42, wherein said first waveguide guides generated light and said second waveguide comprises active material used in the generation of photons.

46. The microcavity structure of claim 45, wherein said active material comprises quantum wells and/or quantum dots.

47. The microcavity structure of claim 45, wherein said first waveguide comprises p-doped material and said second waveguide comprises n-doped material.

48. The microcavity structure of claim 45, wherein said first waveguide comprises n-doped material said second waveguide comprises p-doped material.

49. The microcavity structure of claim 42, wherein said second waveguide guides generated light and said first waveguide comprises active material used in the generation of photons.

50. The microcavity structure of claim 49, wherein said active material comprises quantum wells and/or quantum dots.

51. The microcavity structure of claim 49, wherein said first waveguide comprises p-doped material and said second waveguide comprises n-doped material.

52. The microcavity structure of claim 49, wherein said first waveguide comprises n-doped material said second waveguide comprises p-doped material.

53. A method of forming a microcavity structure comprising:

forming a first waveguide including a first photonic crystal microcavity; and

forming a second waveguide including a second photonic crystal microcavity; and

forming a microcavity active region that is created by overlapping said first layer and second microcavities.

54. The method of claim 53, wherein the photonic crystal surrounds the active microcavity region.

55. The method of claim 53, wherein one or more of the photonic crystals are less reflective to define a single or multiple output path of the generated light.

56. The method of claim 53, wherein the first and second waveguides provide means for material continuity to achieve the conduction of current to the active microcavity overlap region.

57. The method of claim 53, wherein said first waveguide and second waveguide comprise means for electrical activation.

58. The method of claim 57 further comprising at least one contact pad that is coupled to said first waveguide and at least one contact pad that is coupled to said second waveguide so as to apply voltage across said microcavity structure.

59. The method of claim 57, wherein said first waveguide comprises p-doped material and said second waveguide comprises n-doped material.

60. The method of claim 57, wherein said first waveguide comprises n-doped material and said second waveguide comprises p-doped material.

61. The method of claim 53 further comprising a mechanism to provide carrier confinement to the active region by converting the material under portion of the upper waveguide into an insulator.

62. The method of claim 53, wherein at least one of said first and second waveguides is used to guide light.

63. The microcavity structure of claim 53, wherein at least one of said first and second waveguides comprises active material used in the generation of photons.

64. The microcavity structure of claim 63, wherein said active material comprises quantum wells and/or quantum dots.

65. The microcavity structure of claim 62, wherein said first waveguide guides generated light and said second waveguide comprises active material used in the generation of photons.

66. The method of claim 65, wherein said active material comprises quantum wells and/or quantum dots.

67. The method of claim 65, wherein said first waveguide comprises p-doped material and said second waveguide comprises n-doped material.

68. The method of claim 65, wherein said first waveguide comprises n-doped material said second waveguide comprises p-doped material.

69. The method of claim 62, wherein said second waveguide guides generated light and said first waveguide comprises active material used in the generation of photons.

70. The method of claim 69, wherein said active material comprises quantum wells and/or quantum dots.

71. The method of claim 69, wherein said first waveguide comprises p-doped material and said second waveguide comprises n-doped material.

72. The method of claim 69, wherein said first waveguide comprises n-doped material said second waveguide comprises p-doped material.